

R E M A R K S

This is in response to the Office Action that was mailed on September 10, 2003. Claim 1 is amended to recite a sodium carboxymethylcellulose binder, as disclosed for instance in Examples 14, 28, 52, and 63. A corresponding formal amendment is made to claim 6. No new matter has been introduced. With this Amendment, claims 1, 4-8, and 10 are in the case.

THE INVENTION. The presently claimed invention, which requires incorporation of a sodium carboxymethylcellulose binder, provides gas generating compositions that have improved moldability and stability during manufacturing. The sodium carboxymethylcellulose binder component of the present invention is water-soluble. Its presence in the composition facilitates molding of the composition by dissolving all of the components of the composition in water. This is demonstrated, for instance, by Example 14 herein, where a composition of this invention is dissolved in water to obtain a solution having a high viscosity. This high viscosity solution can be easily molded. Even relatively small amounts of sodium carboxymethylcellulose (e.g., a little less than 10%) provide solutions that are high in viscosity and consequently that are easily moldable. The approach of this invention permits the use of water as a solvent. Water, of course, unlike organic solvents, is safe and easy to use in the manufacture of gas generating agents. An additional advantage of the present invention is that sodium carboxymethylcellulose, due to its sodium content, serves as a chlorine neutralizing agent.

Claims 1, 4, 5, 7, and 8 were rejected under 35 U.S.C. 102(e) as being anticipated by US 5,861,571 (Scheffee). The rejection is respectfully traversed.

Scheffee teaches that his compositions "can also include a catalyst such as an iron oxide and a polymeric binder". Column 2, lines 39-40. Scheffee teaches further that the use of cellulose acetate butyrate binder increases initial crush strength. Column 6, lines 46-50. Clearly, the claims in their present form are not anticipated by Scheffee.

The presently claimed invention is not obvious from the Scheffee disclosure, either. Scheffee's cellulose acetate butyrate is not soluble in water. An organic solvent, such as ethyl acetate, will be necessarily used to work and mold the reference composition. See, for instance, Example 227 in Table 1 of the Scheffee patent. In that prior art example, ethyl acetate is used and provides a solution which has a viscosity lower than that of Example 14 in the present application. The Scheffee composition, with its low viscosity, is not readily moldable. The reference is thus inferior to the presently claimed invention with respect to the binders used and the solvents that are compatible with those respective binders. The Scheffee composition may be improved by using large relative amounts of cellulose acetate butyrate to increase the viscosity. With this approach, however, larger amounts of oxidant will be necessary to burn so large an amount of cellulose acetate butyrate, resulting in such undesired results as metal chloride mists and reduced efficiency of gas production. Poisonous gases, including chlorine and hydrochloric acid, will also be generated.

Organic solvents, such as those taught by Scheffee, are dangerous to use, being easily ignitable and so are dangerous in manufacturing procedures. In molding with an organic solvent, most of the organic solvent evaporates away rapidly during molding at temperatures of 20-50°C. Ethyl acetate, for instance, has a boiling point of about 77°C. This results in the production of gas generating agents that are hard and that are difficult to cut and process.

Extruded gas generating compositions made in this way may be broken upon cutting.

Also, cellulose acetate butyrate has a larger oxygen balance than does sodium carboxymethylcellulose. For instance, Daicel's sodium carboxymethylcellulose #2260 has an oxygen balance of -1.004. In contrast, Eastman Chemical Company's cellulose acetate butyrate #381-20 has an oxygen balance of -1.700. The oxygen balance indicates the amount of oxygen necessary to burn a composition completely. Thus, Scheffee's cellulose acetate butyrate would require approximately 1.700 units of oxygen for every 1.004 units of oxygen required by Applicant's sodium carboxymethylcellulose. This improved oxygen efficiency is yet another benefit provided by the present invention as compared to the prior art.

Claims 1, 4, 5, 7, and 8 were rejected under 35 U.S.C. 102(e) as being anticipated by US 5,780,768 (Knowlton). Inasmuch as the Knowlton patent issued more than a year prior to the 8 September 1999 filing date of the present application in the U.S., this rejection should have been made under 35 U.S.C. 102(b). However, Knowlton merely teaches that his compositions "may require a binder for the formation of pellets, grains, or granules". Column 10, lines 17-19. Knowlton neither teaches nor suggests the use of a sodium carboxymethylcellulose binder. Accordingly, Knowlton neither anticipates nor renders obvious the presently claimed invention.

Claims 1, 4, 5, 7, and 8 were rejected under 35 U.S.C. 102(e) as being anticipated by US 6,123,359 (Cabrera). The Cabrera disclosure fails to show any binder, merely showing iron oxide. Accordingly, Cabrera neither anticipates nor renders obvious the invention presently claimed.

Thus, the presently claimed invention distinguishes over and is superior to the prior art, in view of the recited difference in binder, the difference in solvent used in molding, the viscosity of the molding solution, and the amount of oxidant required.

If, even after considering the above discussion, the Examiner believes that any rejection should be maintained against this application, she is requested to contact Richard Gallagher, Reg. No. 28,781, at (703) 205-8008, in order to arrange an interview with Mr. Gallagher and also with the Assignee's local representative, Mr. Kazuya Kataoka.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,
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